

ASSIGNMENT 1

Textbook Assignment: "Liquid Cooling Systems," chapter 1, pages 1-1 through 1-24. "Dry Air Systems," chapter 2, pages 2-1 through 2-9.

Learning objective: Identify and describe the liquid cooling system components and their operation.

1-1. Three of the four methods of cooling are forced-air, air-to-air, air-to-liquid. What is the fourth?

1. Circulation
2. Convention
3. Conversion
4. Convection

1-2. When utilizing forced-air cooling, an air filter must be provided at the air outlet to remove dust and dirt from the exhaust air.

1. True
2. False

1-3. Heat is removed from the air passing by the heat producing source in an air-to-air cooling system by forcing it through what component?

1. Blower
2. RF filter
3. Heat exchanger
4. Fins

1-4. Efficiency is increased in an air-to-liquid cooling system by the use of what system component?

1. Liquid heat exchangers
2. Dual blower motors
3. Larger supply lines
4. Duplex strainers

1-5. What number of basic cooling systems make up a typical liquid cooling system?

1. One
2. Two
3. Three
4. Four

1-6. The secondary cooling system transfers the heat load from the electronic equipment to the primary system.

1. True
2. False

1-7. The Navy uses what number of basic configurations of liquid cooling systems?

1. One
2. Two
3. Three
4. Four

1-8. Which of the following water resources is/are used for primary cooling?

1. Seawater only
2. Chilled water only
3. Seawater and chilled water
4. Potable water and seawater

1-9. The cooling water for the primary cooling system is either seawater or chilled water. The seawater is from the sea and the chilled water is from what source?

1. The liquid cooling system
2. The ship's air conditioning plant
3. The ship's firemain system
4. The reefer deck supply system

1-10. When temperature range is considered to be critical, what type of cooling system would most likely satisfy this need?

1. Type I
2. Type II
3. Type III
4. Type IV

1-11. What type of liquid cooling system can satisfactorily be operated when seawater temperatures reach 95°F?

1. Type I
2. Type II
3. Type III
4. Type IV

1-12. In a primary cooling system, flow regulator may be known by what other term?

1. Expansion tank
2. Demineralizer
3. Gate valve
4. Orifice plate

- 1-13. Open looped seawater systems are also called one-pass because the seawater flows through the system only once.
1. True
 2. False
- 1-14. Secondary cooling systems are which of the following types?
1. Open-loop only
 2. Closed-loop only
 3. Both 1 and 2 above
 4. One-pass
- 1-15. Type I cooling systems employ what type of configuration?
1. Two SW/DW heat exchangers of the same design
 2. Two CW/DW heat exchangers of the same design
 3. One CW/DW heat exchanger and one standby CW/DW heat exchanger
 4. One SW/DW heat exchanger and one standby CW/DW heat exchanger
- 1-16. An expansion tank is installed in what system to compensate for changes in coolant volume?
1. The seawater
 2. The potable water
 3. The distilled water
 4. The chilled water
- 1-17. What term best describes a expansion tank that is located above the highest point in the secondary system and vented to the atmosphere?
1. Pressure tank
 2. Compression tank
 3. Freefall tank
 4. Gravity tank
- 1-18. What term best describes an expansion tank that requires an air charge on the tank and is located below the highest point in the secondary cooling system?
1. Pressure tank
 2. Compression tank
 3. Freefall tank
 4. Gravity tank
- 1-19. What definition best describes the word submicron?
1. Less than one millionth of a meter
 2. Equal to one millionth of a meter
 3. Greater than one millionth of a meter
 4. Equal to one meter
- 1-20. The Type II cooling system employs what configuration?
1. Two SW/DW heat exchangers of the same design
 2. Two CW/DW heat exchangers of the same design
 3. One CW/DW heat exchanger and one standby CW/DW heat exchanger
 4. One SW/DW heat exchanger and one standby CW/DW heat exchanger
- 1-21. The Type III cooling system employs what configuration?
1. Two SW/DW heat exchangers of the same design
 2. Two CW/DW heat exchangers of the same design
 3. One CW/DW heat exchanger and one standby CW/DW heat exchanger
 4. One SW/DW heat exchanger and one standby CW/DW heat exchanger
- 1-22. In a Type III cooling system, the two-way temperature regulating valve is used instead of a three-way valve to regulate the temperature in what system component(s)?
1. The primary loop
 2. The secondary loop
 3. The heat exchangers
 4. The circulating pumps

IN ANSWERING QUESTIONS 1-23 THROUGH 1-29,
SELECT FROM THE FOLLOWING LIST THE
DEFINITION FOR THE TERM USED AS THE
QUESTION.

- A. It is constructed to be shell-type and tube-type in which the secondary coolant flows through the shell, while the primary coolant flows through the tubes.
- B. It maintains a positive pressure on the circulating pump inlet, compensates for changes in the coolant volume and it vents air from the system.
- C. It is used to circulate secondary distilled water.
- D. It regulates the amount of cooling water flowing through or bypassing a heat exchanger to maintain a desired temperature of distilled water going to the electronic equipment.
- E. It is used to provide a constant flow of coolant through the system.
- F. It maintains the secondary cooling system's purity.
- G. It is used in the seawater cooling system to remove debris and sea life, which could clog the pressure and flow control devices.

1-23. Heat exchanger.

- 1. A
- 2. B
- 3. C
- 4. D

1-24. Flow regulators.

- 1. E
- 2. F
- 3. G
- 4. A

1-25. Expansion tank.

- 1. B
- 2. C
- 3. D
- 4. E

1-26. Seawater strainer.

- 1. F
- 2. G
- 3. A
- 4. B

1-27. Temperature regulating valve.

- 1. C
- 2. D
- 3. E
- 4. F

1-28. Circulating pump.

- 1. G
- 2. A
- 3. B
- 4. C

1-29. Demineralize.

- 1. D
- 2. E
- 3. F
- 4. G

1-30. An oxygen analyzer is used to measure the amount of dissolved oxygen in the liquid cooling system. The presence of oxygen causes oxidation within the cooling system.

- 1. True
- 2. False

1-31. When inspecting a telltale drain, you discover that it is leaking. What failure does it indicate?

- 1. The seawater strainer
- 2. The bypass fins
- 3. The tube joint
- 4. The circulating pump

1-32. The overall effectiveness of the heat exchanger is determined by comparing the primary inlet temperature to its outlet pressure. The result of this comparison is best described by what term?

- 1. Temperature variable
- 2. Temperature difference
- 3. Temperature gradient
- 4. Temperature coefficient

1-33. What is the symbol for temperature gradient?

- 1. #T
- 2. %T
- 3. ΔT
- 4. $\pm T$

- 1-34. The device that is inserted in the heat exchanger's water box to concentrate electrolytic action to it vice to the metal of the heat exchanger's tubes is made of what material (s)?
1. Zinc cathode
 2. Zincs only
 3. Zinc anode only
 4. Both 2 and 3 above
- 1-35. Who is the best qualified person on board to determine the overall condition of the cooling system?
1. Engineering officer
 2. Electronics material officer
 3. System's test officer
 4. Ship's maintenance technician
- 1-36. The expansion tank sight glass should normally read in what range?
1. 1/4 to 1/2 full
 2. 1/3 to 2/3 full
 3. 1/2 to 3/4 full
 4. 2/3 to 4/5 full
- 1-37. The low-level alarm switch is usually set at 20 percent of tank capacity. The alarm will initially sound when the distilled water level reaches which of the following levels?
1. 5 percent of full
 2. 10 percent of full
 3. 15 percent of full
 4. 20 percent of full
- 1-38. What term best describes the word makeup water?
1. Distilled water
 2. Seawater
 3. Potable water
 4. Chilled water
- 1-39. When, if ever, may potable water be used in electronic cooling systems?
1. After chloride is added
 2. Only as makeup water
 3. As a replacement for chilled water
 4. NEVER
- 1-40. What is the maximum permissible chloride that may be used in cooling system water?
1. 6.5 epm
 2. 0.65 epm
 3. 0.065 epm
 4. 0.0065 epm
- 1-41. What is an indication that the duplex strainer is clogged?
1. The pressure reading will be 5 to 10 psi below a clean basket reading
 2. The pressure reading will be 5 to 10 psi above the clean basket reading
 3. The water temperature will be 5 to 10 degree below normal
 4. The water temperature will be 5 to 10 degree above normal
- 1-42. If the pressure drop is less than that of a clean basket reading, the basket may be missing.
1. True
 2. False
- 1-43. The three-way temperature regulating valve is used where seawater is the primary cooling medium, and the two-way valve is used where chilled water is the primary cooling medium.
1. True
 2. False
- 1-44. The basic operation of both the two-way temperature regulating valve is the same as the three-way temperature regulating valve except that the two-way valve has a manual override feature.
1. True
 2. False
- 1-45. Temperature regulating valve corrective maintenance consists only of visual checks for leaks and corrosion.
1. True
 2. False
- 1-46. Which of the following devices is used to regulate flow in a seawater cooling system?
1. The gate valve
 2. The globe valve
 3. The orifice plate
 4. The relief valve
- 1-47. Which of the following flow regulators is used to regulate flow in the chilled water system?
1. The globe valve
 2. The orifice plate
 3. The variable orifice
 4. The equipment-flow regulator

- 1-48. Which of the following devices would be used to protect a cooling system from over pressurization?
1. The variable orifice
 2. The pressure regulator
 3. The equipment-flow regulator
 4. The relief valve
- 1-49. What is the function of a typical low-flow switch?
1. To indicate low coolant flow
 2. To indicate excessive coolant flow
 3. To redirect coolant flow to another load
 4. To control coolant flow through the heat exchangers
- 1-50. In a venturi-type flowmeter, the flow rate is measured by what process?
1. The pressure differential between the two taps
 2. The decreased coolant velocity
 3. The turbulence of the coolant
 4. The diameter of the throat
- 1-51. Which of the following flowmeters allows visual inspection of the coolant for entrained air?
1. The orifice-type
 2. The venturi-type
 3. The purity-type
 4. The rotameter-type
- 1-52. Operating a circulating pump with insufficient coolant flow could cause which of the following malfunctions?
1. The overheating of the pump only
 2. The seizure of the pump only
 3. Both 1 and 2 above
 4. The reduction of outlet pressure
- 1-53. What percent of the coolant flows through the demineralizer in one hour?
1. 100%
 2. 50%
 3. 20%
 4. 5%
- 1-54. Which of the following demineralizer components is used to remove small particles from the coolant?
1. The mixed-bed cartridge
 2. The organic cartridge
 3. The oxygen removal cartridge
 4. The submicron filter
- 1-55. Which of the following contaminations is least likely to occur in a distilled water and ethylene glycol coolant system?
1. Dissolved oxygen
 2. Chlorine
 3. Oxidized metal
 4. Bacterial
- 1-56. Demineralize performance and coolant purity is monitored by measuring what property of the coolant?
1. Temperature compensation
 2. Conductivity
 3. Pressure differential
 4. Resistivity
- 1-57. Scheduled maintenance of a demineralizer consists primarily of performing what preventive action?
1. Adjusting the coolant flow through the system
 2. Replacing the purity monitors
 3. Replacing the filters and cartridges
 4. Calibrating the purity monitors
- 1-58. Which of the following contaminants could be considered a source of contamination for an oxygen analyzer sensor?
1. Electrolyte
 2. Oil from your fingers
 3. Direct sunlight
 4. Fluorescent lighting
- 1-59. What position on an alarm switchboard is used for alarm acknowledgement?
1. Normal
 2. Standby
 3. cutout
 4. Test
- 1-60. What position on an alarm switchboard is used to simulate an alarm position?
1. Normal
 2. Standby
 3. Cutout
 4. Test

- 1-61. What is the first step in isolating the extent of waveguide flooding?
1. Secure the cooling system
 2. Estimate the amount of coolant lost
 3. Secure the dry air system
 4. Open the lowest point in the waveguide

Learning Objective: Describe the dry air system components and their operation.

- 1-62. Dew point is best defined by which of the following statements?
1. Temperature at which water vapor begins to deposit as a liquid
 2. Temperature at which water vapor starts to condensate
 3. Temperature of precipitation
 4. Temperature of the water particles in the air
- 1-63. Compressing air has what effect, if any, on relative humidity?
1. It will increase
 2. It will decrease
 3. It will vary inversely with the pressure
 4. None

IN ANSWERING QUESTIONS 1-64 THROUGH 1-67, SELECT FROM THE LIST BELOW THE DEFINITION FOR THE TERM INDICATED IN THE QUESTION.

- A. Uses a combination of refrigeration and desiccant to dry the air
- B. Compresses the air
- C. Uses adsorption ONLY to dry the air
- D. Uses freezing ONLY to dry the air

1-64. Type I dehydrator.

1. A
2. B
3. C
4. D

1-65. Type II dehydrator.

1. A
2. B
3. C
4. D

1-66. Type III dehydrator.

1. A
2. B
3. C
4. D

1-67. Air compressor.

1. A
2. B
3. C
4. D

1-68. What is the normal mode of operation of an equipment air dryer?

1. Start-up
2. Fluid separation
3. Automatic
4. By-pass

1-69. Oil vapor is removed from the compressed air by which of the following methods?

1. By absorption
2. By adsorption
3. By ionization
4. By fluid separation

IN ANSWERING QUESTIONS 1-70 THROUGH 1-75, SELECT FROM THE AIR DRYER COMPONENTS LISTED BELOW AND MATCH THEIR COMPONENTS FUNCTION USED IN THE QUESTION.

- A. Fluid separator
- B. Telltale oil filter
- C. Pressure regulator
- D. Dehydrator

1-70. It contains a desiccant chambers to dry the air.

1. A
2. B
3. C
4. D

1-71. It controls inlet air to the dehydrator.

1. A
2. B
3. C
4. D

1-72. It uses centrifugal force to extract droplets of liquid.

1. A
2. B
3. C
4. D

1-73. It uses absorption to remove oil vapor.

1. A
2. B
3. C
4. D

1-74. It provides the input to the pressure regulator.

1. A
2. B
3. C
4. D

1-75. It discharges oil and water through a muffler.

1. A
2. B
3. C
4. D